

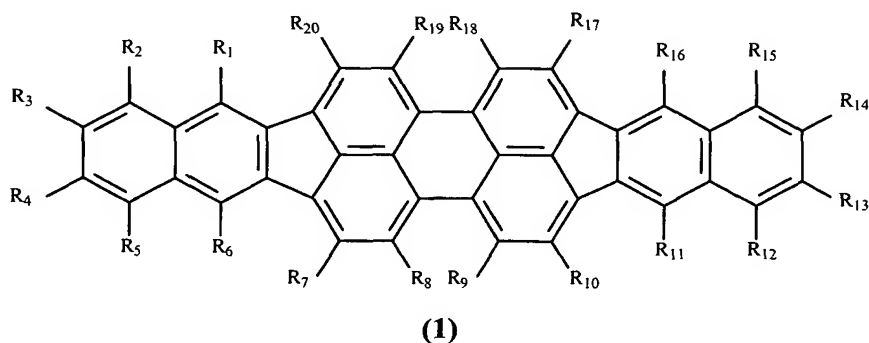
What is claimed is:

1. An OLED device comprising a light emitting layer containing an electroluminescent component having a first bandgap and at least two non-electroluminescent components having second and further bandgaps, respectively, wherein:

- i) the second bandgap is equal to or greater than the first bandgap but is not more than 2.7 eV;
- ii) the further bandgaps are greater than the first and second bandgaps;
- iii) the non-electroluminescent component with the second bandgap is present in an amount of at least 34 weight percent of the total components in the light emitting layer;
- iv) the non-electroluminescent components with further bandgaps are present in a combined amount of 0.1 to 65.9 weight percent of the total components in the light emitting layer; and
- v) the electroluminescent component is present in amount of 0.1 to 5 weight percent of the total components in the light emitting layer.

2. The OLED of claim 1 wherein the light emitting layer contains more than one electroluminescent component.

3. The OLED of claim 1 wherein the electroluminescent component with the first bandgap is a periflanthene derivative represented by formula (1):



wherein:

$R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}, R_{11}, R_{12}, R_{13}, R_{14}, R_{15}, R_{16}, R_{17}, R_{18}, R_{19}, R_{20}$ are independently selected as hydrogen or substituents;

provided that any of the indicated substituents may join to form further fused rings.

4. The OLED of claim 3 wherein at least one $R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}, R_{11}, R_{12}, R_{13}, R_{14}, R_{15}, R_{16}, R_{17}, R_{18}, R_{19}, R_{20}$ are independently selected from the group consisting of halide, alkyl, aryl, alkoxy and aryloxy groups.

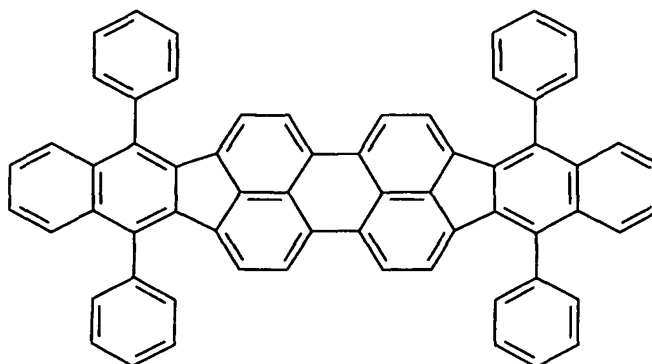
5. The OLED of claim 4 wherein at least one substituent is a phenyl group.

6. The OLED of claim 3 wherein the non-electroluminescent component with the second bandgap is at least 40 weight percent of the total components in the light emitting layer.

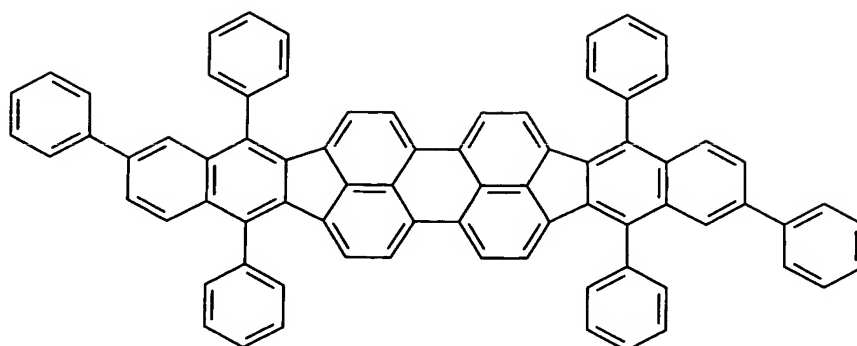
7. The OLED of claim 3 wherein the non-electroluminescent component with the second bandgap is desired to be in the range of 40 to 75 weight percent of the total components in the light emitting layer.

8. The OLED of claim 3 wherein the periflanthene compound is represented by one of the following formulas:

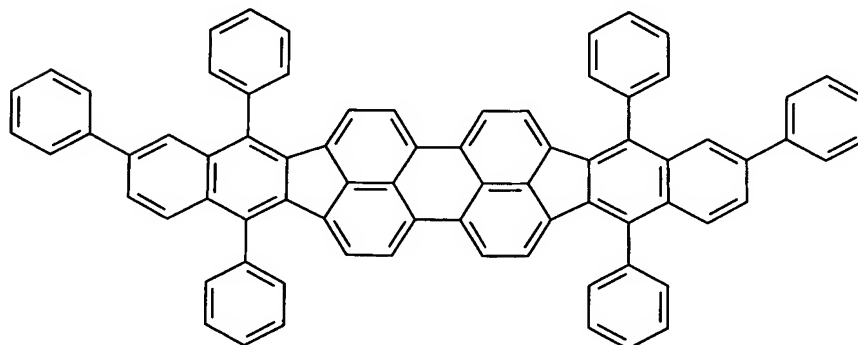
Inv-1



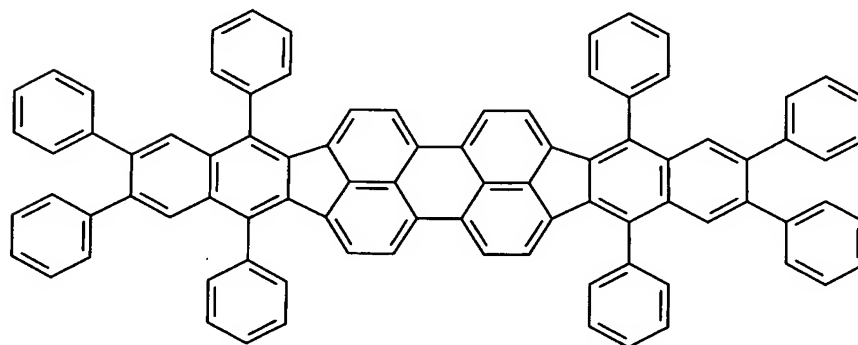
Inv-2



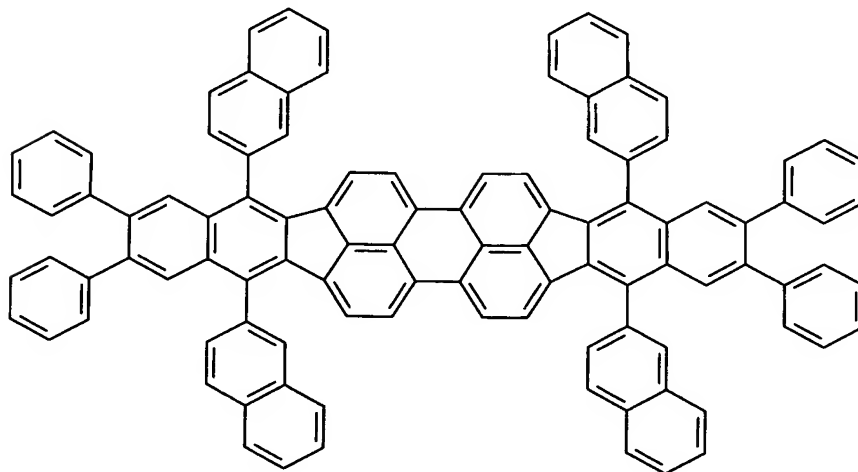
Inv-3



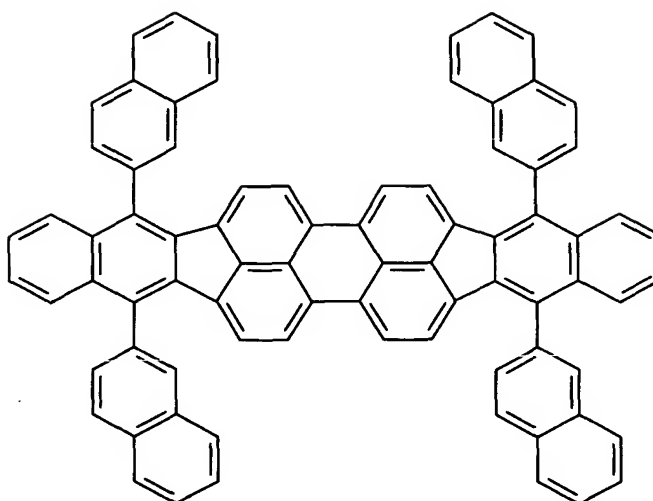
Inv-4



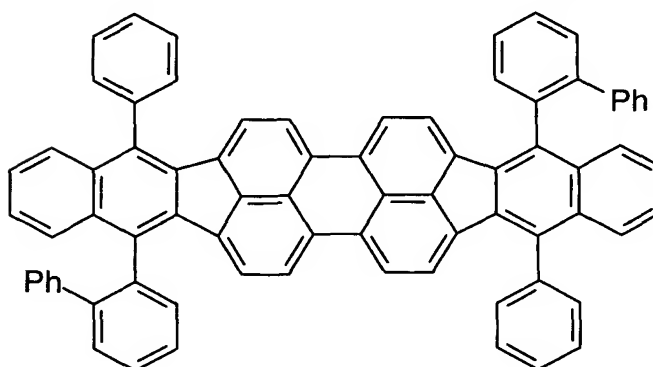
Inv-5



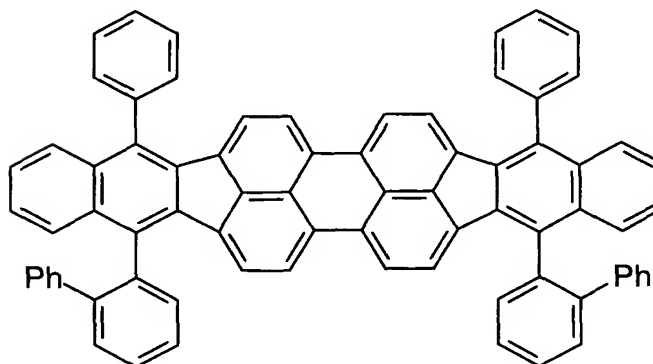
Inv-6



Inv-7



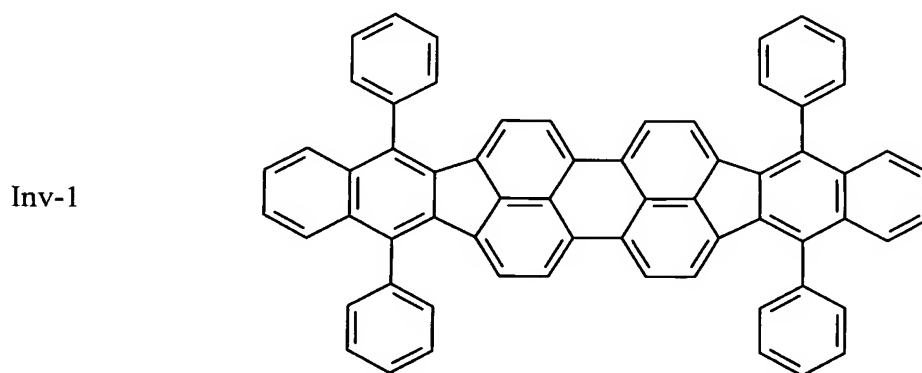
Inv-8



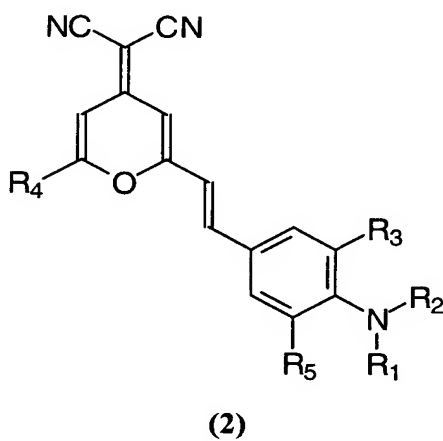
9. The OLED of Claim 3 wherein the electroluminescent component with the first bandgap is in the range of 0.1 to 5 weight percent of the total components in the light emitting layer.

10. The OLED of claim 3 wherein the electroluminescent component with the first bandgap is desired to be 0.3 to 0.7 weight percent of the total components in the light emitting layer.

11. The OLED of claim 3 wherein the electroluminescent component with the first bandgap is represented by formula INV-1:



12. The OLED of claim 1 wherein the electroluminescent component with the first bandgap is a pyran derivative represented by formula (2):



wherein:

R₁, R₂, R₃, R₄, and R₅ are independently selected as hydrogen or substituents;

provided that any of the indicated substituents may join to form further fused rings.

13. The OLED of claim 12 wherein R₁, R₂, R₃, R₄, and R₅ are selected independently from the group consisting of hydrogen, alkyl and aryl groups.

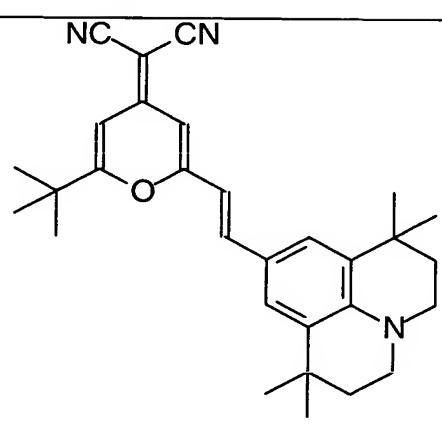
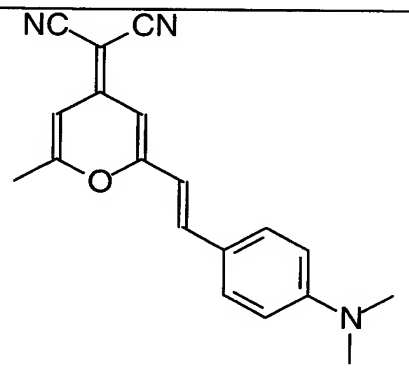
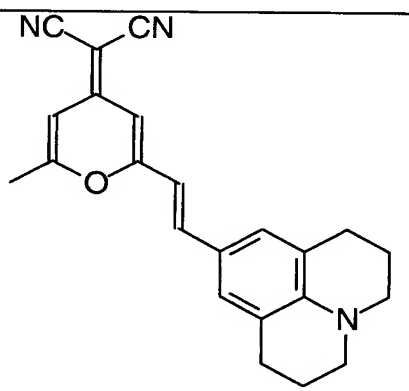
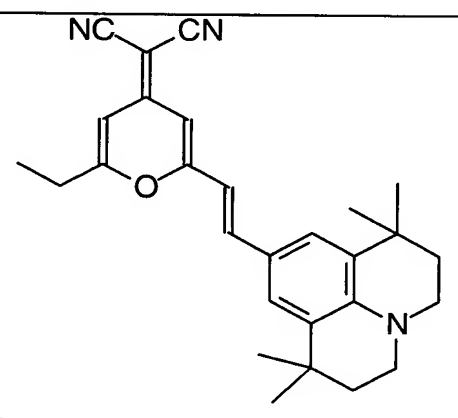
14. The OLED of claim 12 wherein at least one of R₁, R₂, R₃, R₄, and R₅ is independently selected from the group consisting of halide, alkyl, aryl, alkoxy and aryloxy groups.

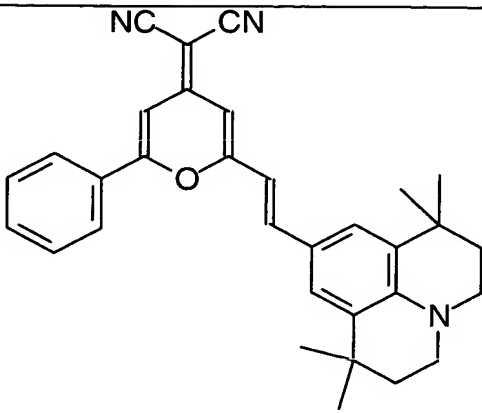
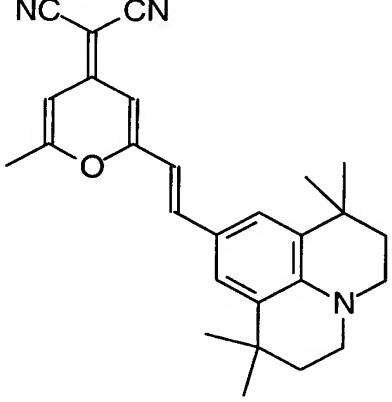
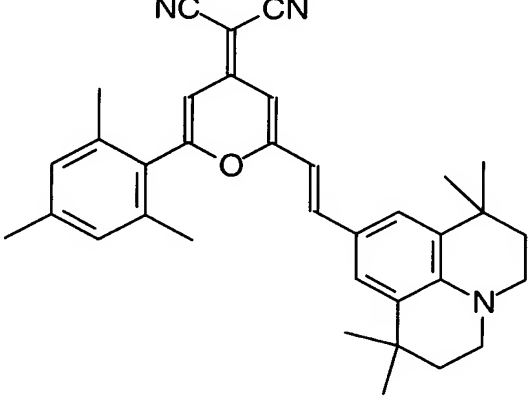
15. The OLED of claim 12 wherein the non-electroluminescent component with the second bandgap is present in an amount of at least 34 weight percent of the total components in the light emitting layer.

16. The OLED of claim 12 wherein the non-electroluminescent component with the second bandgap is present in an amount of at least 40 weight percent of the total components in the light emitting layer.

17. The OLED of claim 12 wherein the non-electroluminescent component with the second bandgap is in the range of 40-75 weight percent of the total components in the light emitting layer.

18. The device of claim 12 wherein the compound of formula (2) is represented by one of the following formulas:

Inv-9	
Inv-10	
Inv-11	
Inv-12	

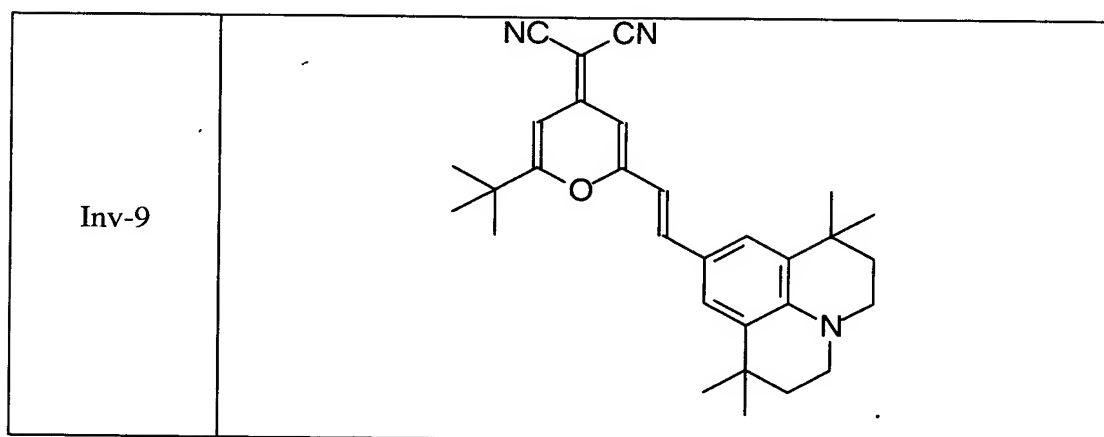
Inv-13	
Inv-14	
Inv-15	

19. The OLED of Claim 16 wherein the electroluminescent component with the first bandgap is desired to be 0.1 to 5 weight percent of the total components in the light emitting layer.

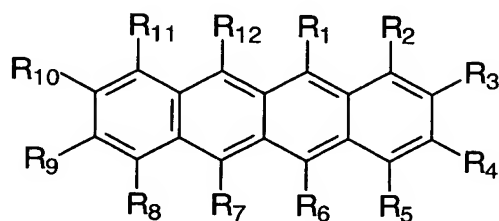
20. The OLED of Claim 16 wherein the electroluminescent component with the first bandgap is desired to be 0.5 to 1.5 weight percent of the total components in the light emitting layer.

21. The OLED of Claim 16 wherein the electroluminescent component with the first bandgap is desired to be 1 ± 0.2 weight percent of the total components in the light emitting layer.

22. The OLED of claim 16 wherein the electroluminescent component with the first bandgap is represented by INV-9:



23. The device of claim 1 wherein the non-electroluminescent component with the second bandgap is a naphthacene represented by formula (3):



(3)

wherein:

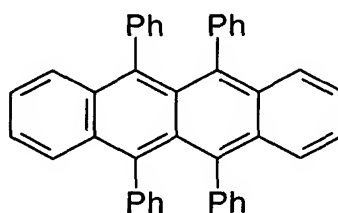
R₁, R₂, R₃, R₄, R₅, R₆, R₇, R₈, R₉, R₁₀, R₁₁, and R₁₂ are independently selected as hydrogen or substituents;

provided that any of the indicated substituents may join to form further fused rings.

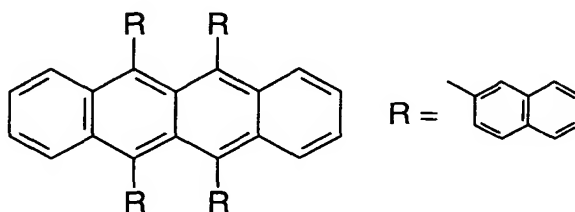
24. The OLED of claim 23 wherein at least one of R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} , R_{11} , and R_{12} are independently selected from the group consisting of halide, alkyl, aryl, alkoxy and aryloxy groups.

25. The device of claim 23 wherein the compound of formula (3) is represented by one of the following formulas:

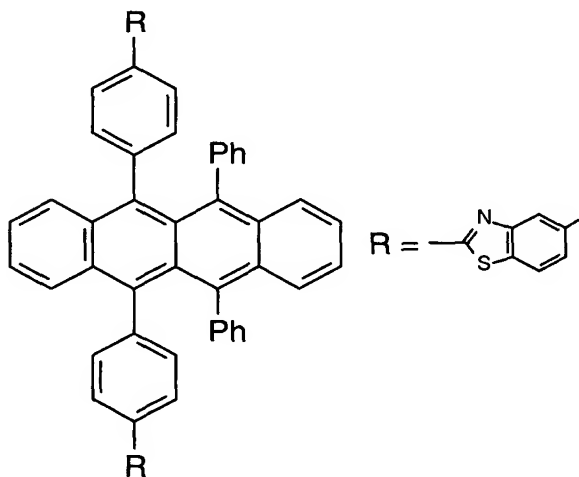
Inv-16



Inv-17

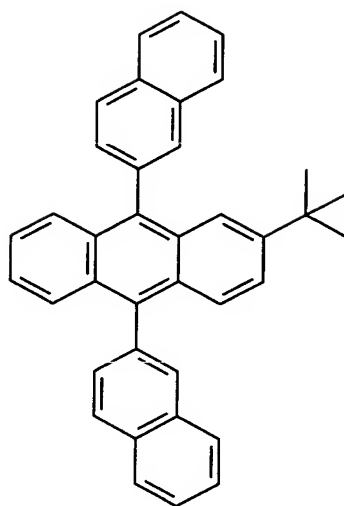


Inv-18

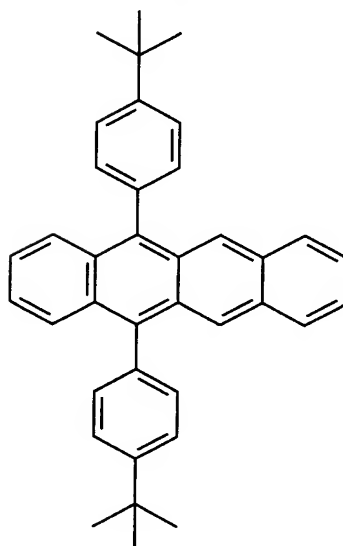


26. The device of claim 1 wherein the non-electroluminescent component with a further bandgap is selected from the following compounds:

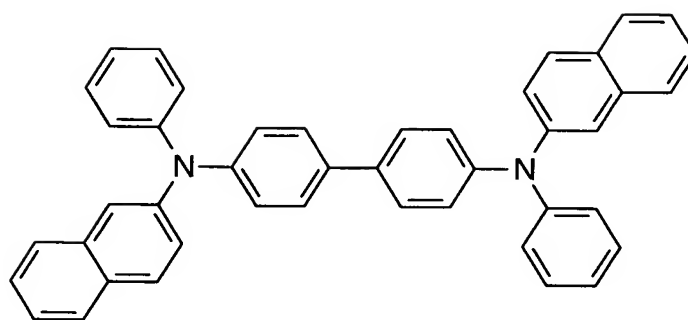
Inv-19



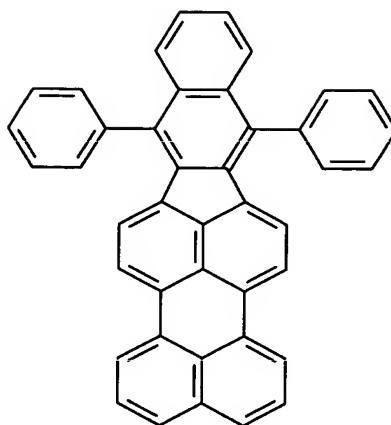
Inv-20



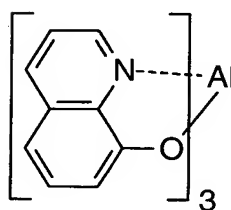
Inv-21



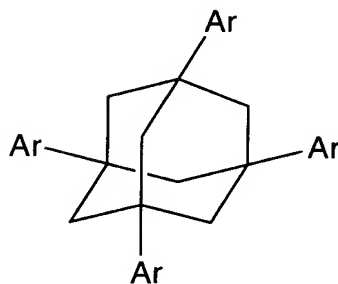
Inv-22



Inv-23

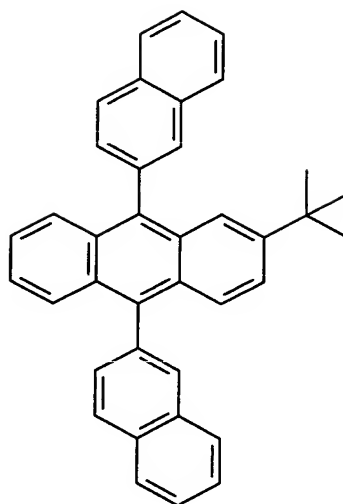


Inv-24

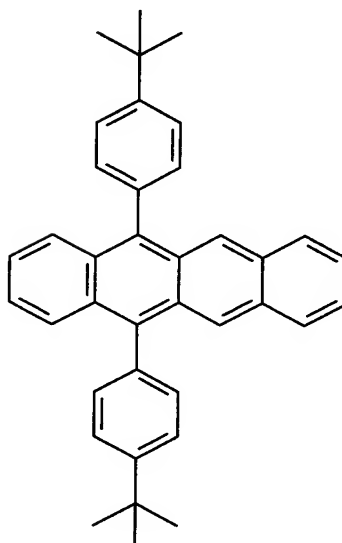


27. The device of claim 1 wherein the non-electroluminescent component with a further bandgap comprises more than one material selected from the following compounds:

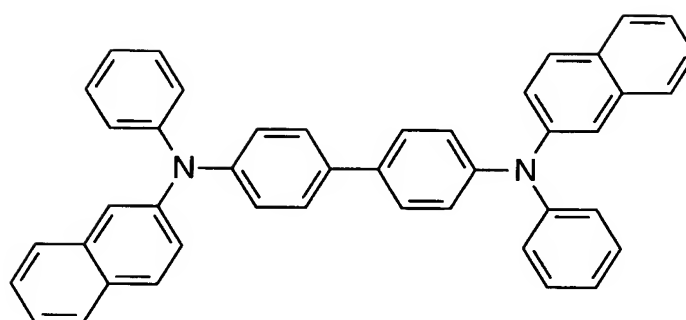
Inv-19

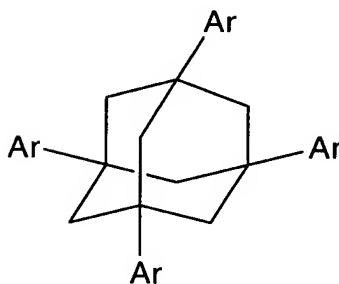
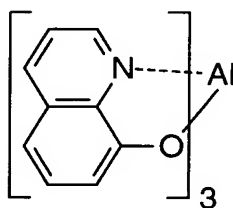
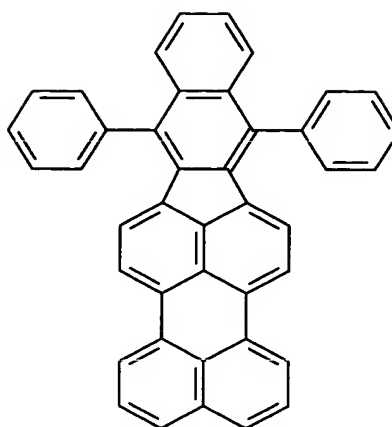


Inv-20



Inv-21





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further bandgaps, respectively are evaporated from compact pellet formed from a mixture of these components in a desired composition.

32. A process for making an OLED device of claim 1 wherein the light emitting layer is formed by evaporating compacted pellets formed from a mixture of luminescent and/or non-luminescent components.

33. A method of making an organic layer from an organic material on a substrate which will form part of an organic light-emitting device, comprising the steps of

- a) forming a consolidated solid pellet from the powder mixture of the organic non-electroluminescent component and/or organic electroluminescent material in a selected weight fraction;
- b) placing the pellet into a physical vapor deposition source disposed in a chamber;
- c) positioning the substrate in the vacuum chamber and in a spaced relationship with respect to the source; and
- d) applying heat to the source to cause a portion of the pellet to sublime to provide a vapor of the first mixture of organic materials from which the organic layer is made on the substrate.

34. An OLED device comprising;

- a) a substrate;
 - b) an anode disposed over the substrate;
 - c) a hole injecting layer disposed over the anode;
 - d) a hole transport layer disposed over the hole injecting layer; and
 - e) a light emitting layer containing an electroluminescent component having a first bandgap and at least two non-electroluminescent components having second and further bandgaps, as in claim 1;
- f) an electron transport layer disposed over the light emitting layer;
- and
- g) a cathode disposed over the electron transport layer.

35. An OLED device comprising a light emitting layer containing an electroluminescent component having a first bandgap and at least two non-electroluminescent components having second and further bandgaps, respectively, wherein:

- i) the second bandgap is equal to or greater than the first bandgap but is not more than 2.7 eV;
- ii) the further bandgaps are greater than the first and second bandgaps;
- iii) the non-electroluminescent component with the second bandgap is present in an amount of at least 10 weight percent of the total components in the light emitting layer;
- iv) the non-electroluminescent components with further bandgaps are present in a combined amount of 0.1 to 89.9 weight percent of the total components in the light emitting layer; and
- v) the electroluminescent component is a perfluoranthene compound and is present in amount of 0.1 to 5 weight percent of the total components in the light emitting layer.

36. An OLED device comprising a light emitting layer containing an electroluminescent component having a first bandgap and at least two non-electroluminescent components having second and further bandgaps, respectively, wherein:

- i) the second bandgap is equal to or greater than the first bandgap but is not more than 2.7 eV;
- ii) the further bandgaps are greater than the first and second bandgaps;
- iii) the non-electroluminescent component with the second bandgap is present in an amount of 10 to 89.9 weight percent of the total components in the light emitting layer;
- iv) the non-electroluminescent components with further bandgaps are present in a combined amount of 0.1 to 89.9 weight percent of the total components in the light emitting layer and is selected from 2,2',2''-(1,3,5-benzenetriyl)tris[1-phenyl-1H-benzimidazole] and 2-*tert*-butyl-9,10-di-(2-

naphthyl)anthracene (TBADN); 5,6,11,12-tetraphenylnaphthacene (rubrene); *N,N'*-di-1-naphthalenyl-*N,N'*-diphenyl-4,4'-diaminobiphenyl (NPB); 5,12-bis[2-(5-methylbenzothiazolyl)phenyl]-6,11-diphenylnaphthacene (DBZR); 5,12-bis[4-*tert*-butylphenyl]naphthacene (tBDPN); and 5,6,11,12-tetra-2-naphthalenylnaphthacene; and

v) the electroluminescent component is present in amount of 0.1 to 5 weight percent of the total components in the light emitting layer.

37. An OLED device comprising a light emitting layer containing an electroluminescent component having a first bandgap a non-electroluminescent component having a second bandgap and at least two non-electroluminescent component having further bandgaps, wherein:

i) the second bandgap is equal to or greater than the first bandgap but is not more than 2.7 eV;

ii) each of the further bandgaps are greater than the first and second bandgaps;

iii) the non-electroluminescent component with the second bandgap is present in an amount of 10 to 89.9 weight percent of the total components in the light emitting layer;

iv) the at least two non-electroluminescent components having further bandgaps are present in a combined amount of 0.1 to 89.9 weight percent of the total components in the light emitting layer and at least one is selected from tris(8-quinolinolato)aluminum (III) (Alq₃); 2,2',2''-(1,3,5-benzenetriyl)tris[1-phenyl-1H-benzimidazole] and 2-*tert*-butyl-9,10-di-(2-naphthyl)anthracene (TBADN); 5,6,11,12-tetraphenylnaphthacene (rubrene); *N,N'*-di-1-naphthalenyl-*N,N'*-diphenyl-4,4'-diaminobiphenyl (NPB); 5,12-bis[2-(5-methylbenzothiazolyl)phenyl]-6,11-diphenylnaphthacene (DBZR); 5,12-bis[4-*tert*-butylphenyl]naphthacene (tBDPN); and 5,6,11,12-tetra-2-naphthalenylnaphthacene.; and

v) the electroluminescent component is present in amount of 0.1 to 5 weight percent of the total components in the light emitting layer.